

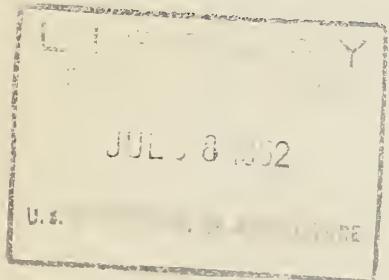
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UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

**COST OF PREPACKAGING POTATOES
IN
MAINE, MICHIGAN AND PENNSYLVANIA**



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A study conducted with funds provided
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UNITED STATES DEPARTMENT OF AGRICULTURE
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SUMMARY

This study analyzes the costs of packing potatoes in various sized containers at 19 shipping points, and compares these costs as reported by two groups of packers -- farm packers and centralized packers. Analysis of data obtained from 10 farm packers and nine centralized packers in Pennsylvania, Maine and Michigan in 1950-51 revealed the following facts:

1. The costs of packing potatoes in 100, 50, 15 and 10-pound bags totaled 52, 44, 55 and 72 cents a hundred pounds, respectively. The cost of materials was the largest item in these totals, with labor the second largest.
2. Costs varied between the two types of packers. Centralized packers prepackaged consumer-sized units at lower costs than did the farm packers. Their labor costs were also lower, but their depreciation costs were higher than those of farm packers. Centralized packers had a greater investment in buildings and equipment, which accounted for the high depreciation costs.
3. Regardless of type, large packers -- those handling over 10,000 hundredweight of potatoes in 1950-51 -- packaged the consumer-sizes for less than small packers handling fewer than 10,000 hundredweight. Both groups packed 100-pound bags for about the same cost.
4. Some cost differences among the 19 packers resulted from varying prices paid for similar materials, for wages and for the value of overweight potatoes (extra potatoes put in bags to insure maintenance of stated weights). Assuming uniform prices, the cost variations between farm and centralized packers became less. On the other hand, the difference between the costs of packing large and small containers was greater using the recomputed costs.
5. Farm packers used considerable unpaid family labor. This labor averaged 27 percent of the total farm labor force, ranging from a high of 75 to a low of 8 percent among the 10 growers.
6. Packing a hundredweight of potatoes in 15-pound bags required 28 percent more labor than packing in 100-pound bags. Ten-pound bags required 75 percent more labor than the 100's. In one hour an average crew of eight men were able to pack 47 hundredweight in 100-pound bags, 43 in 50-pound bags, 37 in 15-pound bags and 27 in 10-pound bags.
7. Extra potatoes for overweight in the smaller containers was greater per hundredweight than in large containers. For example, about three times as many extra potatoes were put in a hundredweight of 10 pound packages as in 100 pound packages.
8. A total of 205,750 hundredweight of potatoes were packed in the four popular sizes. Of these, 40 percent were packed in 15's, 35 percent in

100's, 16 percent in 50's and 9 percent in 10's. Farm packers were relatively higher in the quantity of 15's packed. Centralized packers were relatively higher in 100's and 50's.

This study concludes that although potato packers -- both farm and centralized -- may benefit by packing potatoes in the least costly popular size, they should also consider consumer demands. Where retail customers prefer the 10-pound bag to the 15-pound size, the added cost of packing should be reflected in the retail price. In the last analysis, prepackaging should be geared to the demands of the consumer.

Note: While the 1950-51 cost figures used in this study may have changed since that season, the actual physical units of inputs for the different groups and types of packers should remain the same.

COST OF PREPACKAGING POTATOES IN MAINE, MICHIGAN AND PENNSYLVANIA

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Changes in food distribution, particularly in prepackaging, grew with the development of the self-service retail grocery store. Retailers asked that many foods be packaged in container sizes most in demand by consumers. The results may be seen in any grocery, with dried, fresh and frozen foods attractively packaged in consumer sizes. Produce items have been slow to adopt prepackaging, because of spoilage, the costs of handling and other special problems. But gradually some fresh fruits and vegetables have been appearing in cartons, bags and cellophane wrappings ready for the consumer, although most fresh produce is still sold in bulk.

White potatoes were one of the first produce items to be prepackaged, the development having started prior to World War II. Since potato consumption per capita had been in steady decline for many years, the potato industry encouraged growers to do a more satisfactory job of promotion and merchandising. One solution was to move to consumer packaging.

The potato industry believes that consumer packaging -- prepackaging -- helps the potato grower in several ways. It fits the needs of the retail store operator. It gives the grower and shipper an opportunity to establish a brand name. It cuts down on the waste loss to the retailer that occurs in bulk sales. And above all it increases consumer purchasing.

Potatoes are prepackaged both in the terminal markets and at shipping points. In terminal markets, wholesale receivers, chain stores and potato repackers do the packaging while independent shippers, grower-shippers and farmers' cooperatives undertake the job at shipping points.

Since growers recognize the advantages of prepacking potatoes in consumer sized units, one of their chief concerns is the relative costs of packing in the various popular sized containers.

This study, then, is an analysis of the costs of prepackaging potatoes. It was made as one segment of an overall program of research on prepackaging in the Department of Agriculture. The study was made with funds made available under the Research and Marketing Act of 1946. Its objectives are: (1) To determine the cost of packing potatoes in 100, 50, 15 and 10-pound containers; (2) to compare packing costs between farm and centralized packers; (3) to analyze the factors affecting the cost of packing potatoes; and (4) to describe the methods of operation and type of equipment used by farm and centralized packers.

METHOD OF STUDY

Data on the cost of packing potatoes was collected from 19 packers in the States of Maine, Michigan and Pennsylvania, for the 1950-51 season. The packers selected were those known to be packing the various container sizes. Ten of the group were grower-packers and nine were centralized packers. These packers kept a detailed record of their operations, including a record of daily labor, quantity packed and loaded daily, test weights of each size container, cash expenses and cost of utilities. Information on building and equipment values, taxes, insurance, repairs and inventories were obtained through interviews. Costs in this study include only the cost of packing and loading. The cost of storage, harvesting and other related operations are not included. Labor costs begin with the labor used to start the potatoes through the packing process. Depreciation is on that portion of buildings and equipment actually used in packing, and was determined from the packers' estimated value of each building and piece of equipment and the expected remaining life. For a more detailed explanation of the procedures used in this study see the appendix.

PRODUCING REGIONS

Potato production in the United States is divided into two geographical areas -- the early and intermediate region and the late region. The early and intermediate region generally includes the southern half of the country, while the late region roughly takes in the northern half (see figure 1).

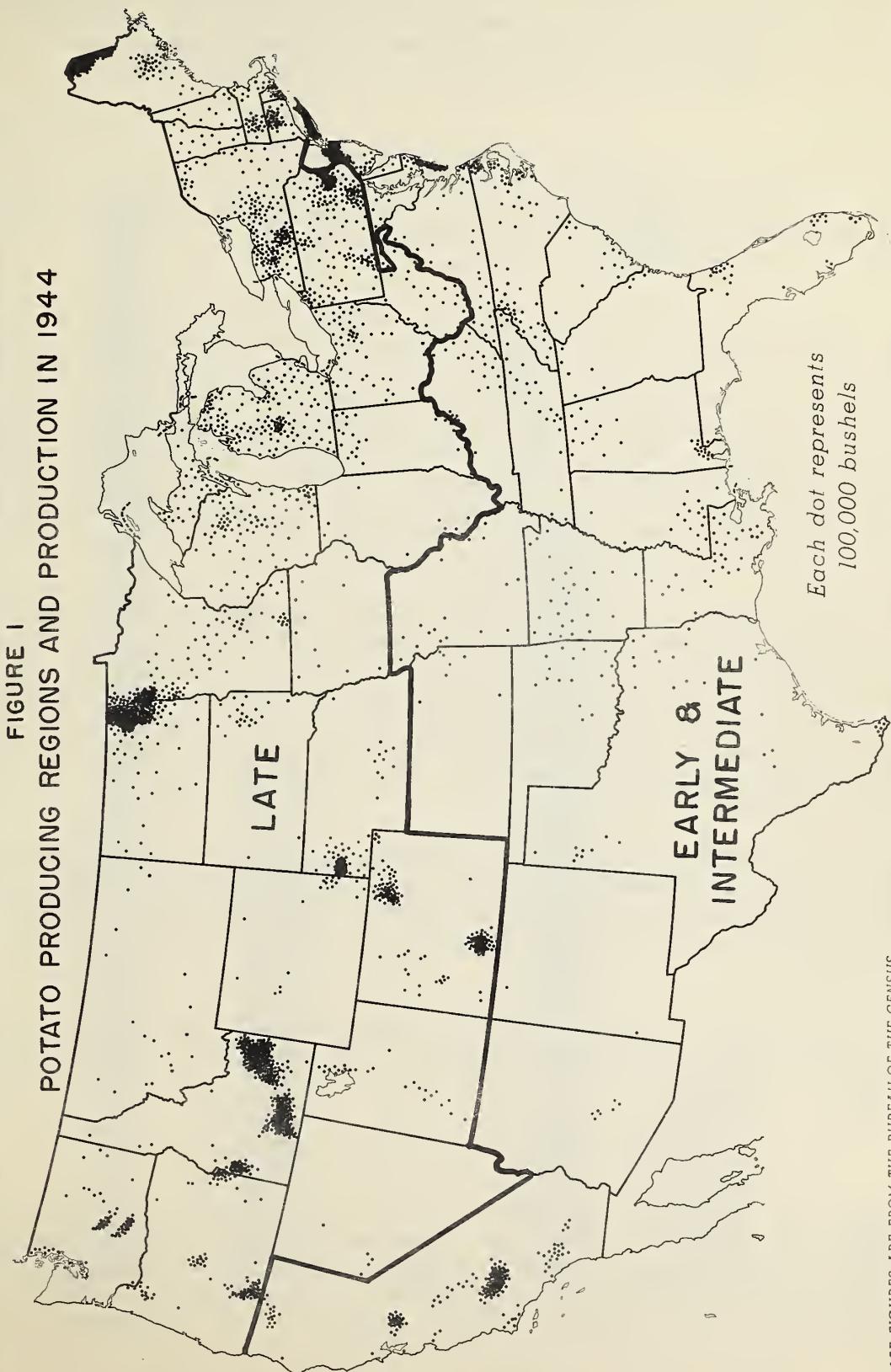
In the late producing States, potatoes are usually prepackaged at shipping points. Here potatoes are dug in the early fall, stored, and shipped throughout the fall and winter. In the early States where potatoes are not stored for long periods, the crop goes directly from the field to the shed for bulk packaging and then to market. This study on the cost of prepackaging potatoes, must be limited, therefore, to the late region.

PACKING METHODS

Potatoes in the late region are prepackaged (a) on the grower's farm and (b) in centralized warehouses.

Farm packing is a continuation of the cultivation and harvesting activities on individual farms. After harvesting, the producer either packs his own potatoes or supervises their packing in his own buildings. He generally owns the equipment he uses. Labor may be family or other regular farm workers, with sometimes additional labor hired especially for the packing operation. Crews for farm packers included in this study ranged from 4 to 10, and averaged six workers. The primary advantage of farm packing is that it enables the grower to make efficient use of his regular farm labor. For example, the farm operator packs potatoes during winter slow work periods, thus using his labor more

FIGURE I
POTATO PRODUCING REGIONS AND PRODUCTION IN 1944



BASE FIGURES ARE FROM THE BUREAU OF THE CENSUS

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productively. However, this intermittent packing has disadvantages, too. It is more economical, in terms of per unit costs, to pack until the job is finished, than to reassemble crews, packaging materials and start machinery running for short periods. Another disadvantage occurs when the available farm facilities are not adequate for efficient operations.

The 19 farm packers in this study operated farms valued at an average of \$24,111, ranging from a high of \$40,000 to a low of \$10,000. Of this value, buildings on these farms averaged \$14,500. Potato storage structures on these farms had an average capacity of 19,000 bushels, ranging from 7,000 to 50,000 bushels.

The second packing method analyzed is centralized packing. Growers bring their potatoes to a central warehouse where potatoes are packed immediately or stored and packaged later. Facilities may be owned by individuals or cooperatives. Crews for centralized packers ran from 5 to 13, and averaged about eight. Usually centralized packers handle a larger volume than does a single grower on his own farm, despite the relatively similar number of workers. However, unless labor can be readily shifted to other operations when interruptions of potato packing occur, the costs of prepackaging potatoes may be higher in centralized operations than in like operations on the farm.

Centralized packers were questioned on the advantages of packing in centralized warehouses as compared with farm packing. According to them, the advantages of centralized packing were: (1) uniformity of grade, (2) better quality, (3) more and better services, such as washing, sorting, etc., (4) availability of potatoes as needed, and (5) protection for growers from the alleged bad practices of spot truck buyers. The disadvantages mentioned were: (1) high capital investment and (2) another middleman made necessary.

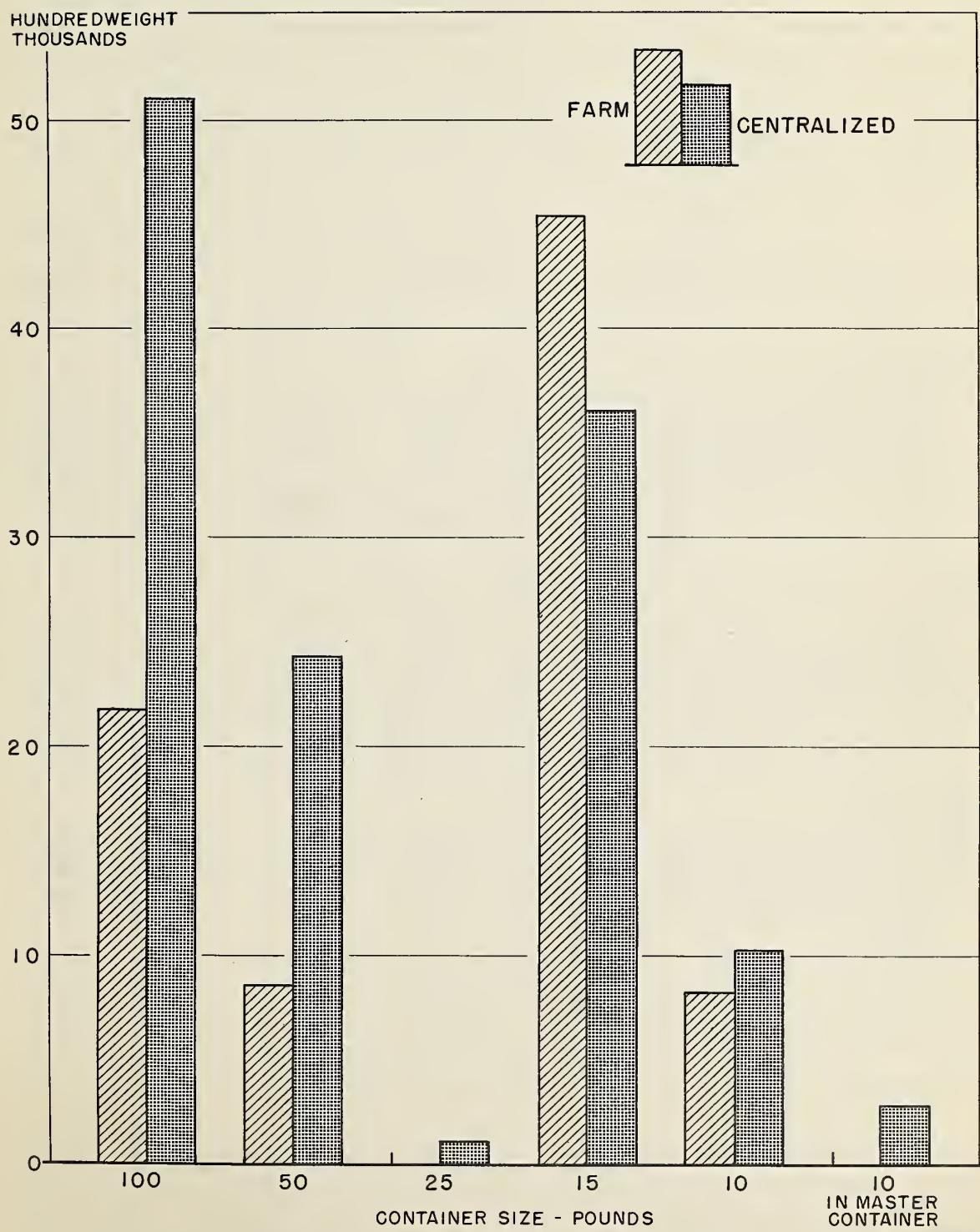
The nine centralized packers used different practices in paying growers--four paid the individual grower when they sold his potatoes; five paid the grower when he delivered his potatoes to the association. None of the centralized packers reported pooling and paying growers at the close of the pool.

A third method of packing -- custom packing -- is found in a few areas in the late region. This study, however, did not include custom packing inasmuch as the method was not practiced in the three States surveyed in 1950-51.

QUANTITY PACKED BY SIZE OF CONTAINER

The 19 packers together prepackaged more potatoes in 15-pound containers than any other size. The next most important container in quantity used was the 100-pound bag, followed in order by the 50 and 10-pound size. A small volume of potatoes was packed in 25-pound bags, and some 10-pound bags were put in master containers holding five 10-pound bags. Figure 2 shows the quantity packed in the various sizes for farm and

FIGURE 2
QUANTITY PACKED IN EACH SIZE CONTAINER
ACCORDING TO TYPE OF PACKER



centralized packers. Farm packers packaged a higher percentage in 15-pound containers; centralized packers a greater percentage in 100-pound units.

COST OF PACKING IN DIFFERENT SIZE CONTAINERS

The average cost of packing a hundredweight potatoes in 100, 50, 15 and 10-pound containers was 52.2, 43.5, 55.0 and 72.4 cents respectively, as shown by data in table 1. The cost for packing 15's averaged only

Table 1. - *Average cost per hundredweight of packing potatoes in various size containers, 1950-51*

Size container	100 lbs.	50 lbs.	15 lbs.	10 lbs.
Number of packers	18	18	19	12
Number of hundredweight	72,793	32,966	81,458	18,533
Items of cost:				
Materials:				
Containers-----	\$.290	\$.174	\$.265	\$.345
Other packing-----	.004	.011	.010	.012
Miscellaneous supplies-----	.003	.001	.002	.004
Total-----	\$.297	\$.186	\$.277	\$.361
Labor:				
Packing-----	\$.125	\$.126	\$.149	\$.190
Loading-----	.013	.016	.021	.033
Miscellaneous ¹ -----	.009	.013	.016	.025
Total-----	\$.147	\$.155	\$.186	\$.248
Other costs:				
Electricity-----	\$.005	\$.004	\$.004	\$.007
Repairs-----	.005	.004	.004	.004
Taxes and insurance-----	.003	.008	.003	.002
Depreciation (or rent)				
Buildings-----	.022	.025	.021	.036
Equipment-----	.030	.026	.023	.028
Total-----	\$.065	\$.067	\$.055	\$.077
Overweight-----	\$.013	\$.027	\$.032	\$.038
Total costs-----	\$.522	\$.435	\$.550	\$.724

¹ Includes handling cull potatoes, cleaning, idle time, other casual labor and managerial functions.

slightly higher than the cost for 100's. These were, by far, the most popular sizes among the 19 packers. A small quantity of potatoes were packed in 25-pound units and in master containers holding five 10-pound bags as shown in figure 2. The quantity so packed was too small for valid comparison with costs for the more popular sizes. The average total costs for 25's was 58.5 cents; for 10's in master containers, 88.4 cents per hundredweight.

In the breakdown of total expenses, labor costs were higher for packing the smaller containers than for the larger. The cost of materials -- the major item of cost -- was higher for 100's than 50's or 15's, but was lower than the cost of materials for 10's. The relatively high cost for 100's can be traced to the use of burlap bags. All the smaller sized bags in this study were solid paper.

The costs for overweight (extra potatoes put in bags to insure maintenance of stated weights) were higher for each smaller sized bag. These costs were computed by multiplying the quantity of extra potatoes per hundredweight by the farm price per pound. Farm price or value for potatoes was computed separately for each State from the monthly prices paid growers, as reported by the Bureau of Agricultural Economics, U. S. Department of Agriculture. The cost of the overweight potatoes for 10-pound containers was about three times the cost for 100's. While the overweight for 10's was much smaller per container, it was much higher in relation to the percentage of the total potatoes in the container.

COST VARIATION BETWEEN FARM AND CENTRALIZED PACKERS

Costs of packing 100-pound bags were lower for farm packers than for centralized packers, but higher in each of the smaller bags. However, the costs for 15's -- the most important of the small sizes -- were only about 3 cents higher for farm packers as shown by data in table 2.

The lower costs for 100's was caused primarily by substantially lower costs for bags. Some farm packers purchased second-hand bags at substantially lower prices. Others used some bags furnished by their customers. Their estimated prices for these bags may have been low.

Labor costs of farm packers were somewhat higher for each size. Centralized packers generally had mechanized their operation more and their average volume handled was higher. These conditions made for lower labor costs. Centralized packers were 2.4 cents lower in labor costs for 100's than farm packers, 7.3 cents lower for 50's, 5.6 cents lower for 15's and 12.1 cents lower for 10's.

The cost of depreciation, on the other hand, was considerably lower for farm packers than for centralized packers. Some centralized packers were operating considerably below optimum capacity, which caused fixed depreciation charges to be extremely high on a unit basis when related

Table 2. - Average cost per hundredweight of packing potatoes in various sized containers, according to type of packer, 1950-51

Type of packer	Size container							
	100 lbs.		50 lbs.		15 lbs.		10 lbs.	
	Farm	Centralized	Farm	Centralized	Farm	Centralized	Farm	Centralized
Number of packers	9	9	10	8	10	9	6	6
Number of hundredweight	21,796	50,997	8,645	24,321	45,385	36,073	8,271	10,262
Items of cost:								
Materials:								
Containers-----	\$.188	\$.334	\$.187	\$.169	\$.279	\$.247	\$.376	\$.320
Other packing-----	.001	.005	.001	.014	.001	.022	.002	.019
Miscellaneous supplies	.001	.004	.001	.002	.001	.003	.002	.006
Total-----	\$.190	\$.343	\$.189	\$.185	\$.281	\$.272	\$.380	\$.345
Labor:								
Packing-----	\$.132	\$.122	\$.180	\$.107	\$.173	\$.119	\$.248	\$.142
Loading-----	.013	.013	.016	.015	.021	.021	.035	.030
Miscellaneous-----	.019	.005	.013	.014	.017	.015	.031	.021
Total-----	\$.164	\$.140	\$.209	\$.136	\$.211	\$.155	\$.314	\$.193
Other:								
Electricity-----	\$.003	\$.005	\$.002	\$.004	\$.004	\$.004	\$.006	\$.007
Repairs-----	.012	.002	.017	(2)	.007	.001	.010	(2)
Taxes and insurance-----	.003	.002	.003	.009	.003	.002	.004	(2)
Depreciation (or rent)								
Building-----	.006	.029	.011	.030	.007	.039	.013	.055
Equipment-----	.012	.038	.014	.030	.014	.034	.023	.032
Total-----	\$.036	\$.076	\$.047	\$.073	\$.035	\$.080	\$.056	\$.094
Overweight-----	\$.020	\$.010	\$.043	\$.021	\$.038	\$.025	\$.053	\$.027
Total costs-----	\$.410	\$.569	\$.488	\$.415	\$.565	\$.532	\$.803	\$.659

¹Contrary to expectations, farm labor for packing 50's was about the same as for 15's, as the above data show. This resulted from the below average costs of one large packer who packaged mostly 15's; plus the fact that most farm packers packaged more 15's than 50's thus causing relatively efficient operations for 15's and inefficient operations for 50's.

²Less than \$0.001.

to volume packed in 1950-51. In addition, farm packers had a lower average investment in buildings than centralized packers as shown by the following:

	Average investment in:	
	<u>Buildings</u>	<u>Equipment</u>
Farm packers:	\$5,950	\$970
Centralized packers:	34,845	3,656

Farm packers ranged from a low of \$2,500 to \$15,000 invested in buildings and from \$233 to \$2,232 invested in equipment. Centralized packers ranged from \$24,380 to \$45,000 invested in buildings, and \$1,968 to \$10,399 invested in equipment. Also contributing to higher depreciation charges was the fact that several of the centralized warehouses were rented. In these cases the rent paid was charged in lieu of depreciation. Rent paid on the buildings was higher than depreciation on comparable structures owned by cooperatives.

The cost of overweight potatoes was higher for farm than for centralized packers. Better and more accurate weighing equipment generally used by centralized packers in filling bags was probably responsible for their lower costs.

RANGE IN COSTS BETWEEN INDIVIDUAL PACKERS

Costs varied considerably among the 19 packers. However, since these operations were from different areas, and covered different types of services, the cost variation was to be expected. The following tabulation shows the distribution of the 19 packers by average total costs:

<u>Cost in cents</u>	<u>Container Sizes</u>	
	<u>100 lbs.</u> packers	<u>15 lbs.</u> packers
20 to 29.9-----	1	0
30 to 39.9-----	4	0
40 to 49.9-----	4	2
50 to 59.9-----	6	8
60 to 69.9-----	3	7
70 to 79.9-----	0	2
	18	19

The high and low costs for each item of cost, by container sizes, for farm and centralized packers is shown in table 3. The wide range in costs of materials, especially for 100's, resulted from different prices paid for the bags mentioned earlier. Packers who packaged only a small quantity in a particular size found their costs very high in proportion for that size. The range in costs was generally lower for centralized packers, except in the case of depreciation as indicated previously. The fact that some centralized packers had abnormally low volumes caused average depreciation charges to be extremely high.

Table 3. - *High and low costs for the various items of cost for farm and centralized packers.*

Cost	Farm packers				Centralized packers			
	100 lbs.		15 lbs.		100 lbs.		15 lbs.	
	High	Low	High	Low	High	Low	High	Low
Materials-----	\$.315	\$.103	\$.316	\$.229	\$.390	\$.280	\$.310	\$.235
Labor-----	.226	.062	.330	.137	.164	.079	.242	.114
Other-----	.084	.016	.106	.017	.187	.047	.191	.052
Overweight-----	.042	.013	.059	.052	.018	.007	.034	.014
Total ¹ -----	\$.604	\$.279	\$.728	\$.466	\$.667	\$.442	\$.661	\$.455

¹Totals are high and low total costs reported by individual packers and not additions of items above.

COST VARIATIONS BETWEEN LARGE AND SMALL PACKERS

Large packers -- those handling 10,000 hundredweight or over -- had slightly higher costs for packing 100's, but lower costs for 15's than those small packers handling under 10,000 hundredweight. Data in table 4

Table 4. - *Average cost per hundredweight for packing potatoes in 100 and 15-pound bags, according to type of packer and volume packed, 1950-51*

	Size Container			
	Amount packed in 100 lb. bags		Amount packed in 15 lb. bags	
	Under 10,000 hundredweight	10,000 hun- dredweight and over	Under 10,000 hundredweight	10,000 hun- dredweight and over
Farm Packers				
Number of packers-----				
Hundredweight-----	6 10,680	3 11,116	7 11,900	3 33,485
Items of cost:				
Materials-----	\$.168	\$.211	\$.275	\$.284
Labor-----	.159	.169	.249	.197
Other-----	.043	.028	.057	.027
Overweight-----	.019	.022	.044	.035
Total-----	\$.389	\$.430	\$.625	\$.543
Centralized Packers				
Number of packers-----				
Hundredweight-----	4 12,289	5 38,705	4 7,440	5 28,633
Items of cost:				
Materials-----	\$.333	\$.346	\$.288	\$.268
Labor-----	.144	.139	.189	.146
Other-----	.080	.075	.107	.074
Overweight-----	.012	.010	.029	.023
Total-----	\$.569	\$.570	\$.613	\$.511

show average costs for packers by size groups, and by farm and centralized packers. Large packers -- both farm and centralized -- were considerably lower than small packers in their cost of packing 15's. Lower costs for labor contributed to the lower total costs. Depreciation (or rent) per unit packed also was lower for the large packers. The large farm packers had higher costs for packing 100's than the small farm packers. This was caused mainly by the differences in the prices paid for bags.

COST OF PACKING, ASSUMING UNIFORM PRICES AND WAGES

Some variation in costs as shown in tables 1, 2 and 4 resulted from different prices paid for some materials, from diverse wage rates between packers and dissimilar values of overweight potatoes between the areas. To determine, therefore, the variations in cost between farm and centralized packers on a uniform basis of prices and wages, their costs were recomputed using the same prices and wages for all packers. Uniform rates were determined for the price of bags and ties, wages paid labor and the value of overweight potatoes. All other cost remained unchanged. This comparison is presented in table 5. Farm packers have lower costs

Table 5. - *Average cost per hundredweight for packing potatoes in various sized bags, according to type of packer using constant prices for materials and overweight potatoes and constant wages for labor¹*

Type of packers	Size bags							
	100 lbs.		50 lbs.		15 lbs.		10 lbs.	
	Farm	Centralized	Farm	Centralized	Farm	Centralized	Farm	Centralized
Items of cost:								
Materials-----	\$.307	\$.310	\$.196	\$.198	\$.310	\$.312	\$.466	\$.469
Labor-----	.151	.144	.205	.141	.203	.166	.311	.211
Other-----	.035	.076	.037	.074	.035	.081	.056	.095
Overweight-----	.021	.014	.038	.022	.046	.031	.056	.045
Total-----	\$.514	\$.544	\$.476	\$.435	\$.594	\$.590	\$.889	\$.820

¹The prices used for bags were \$300, \$95, \$45 and \$35 per thousand for 100, 50, 15 and 10-pound bags respectively. A wage rate of 85 cents per hour was used. Overweight potatoes were charged at 1.4 cents per pound.

for packing 100's but when bag prices are recomputed the difference is not as great as that shown in table 2. Centralized packers are lower in packing 50's and 10's. Farm and centralized packers have about the same costs for packing 15's. Total costs for most sizes are slightly higher in table 5 than in table 2.

The cost of materials shown in table 5 was computed using the scale of bag prices that prevailed for most packers near the end of the 1950-51 season. These prices for 100, 50, 15 and 10-pound bags are \$300, \$95, \$45 and \$35 per thousand respectively. These prices include the necessary ties.

The price of bags rose during the season for most packers. For example, some packers paid \$35 per thousand for 15's early in the season and over \$45 near the end. Fifties rose in price for some packers from \$83 per thousand to over \$99.

The cost of labor shown in table 5 was computed using a uniform hourly rate of 85 cents as contrasted with labor costs estimated and reported by individual packers in table 2. This contrast does not change the fact that farm packers had higher labor costs for each size bag in both tables. However, the difference between farm and centralized packers is not great, inasmuch as centralized packers paid somewhat lower wages on the average.

The cost of overweight potatoes was determined by using a value of 1.4 cents per pound for potatoes. This is the average farm value -- farm price per pound -- for the States in this study as computed from data published by the Bureau of Agricultural Economics, U. S. Department of Agriculture.

SPECIFIC OPERATING PRACTICES RELATING TO COSTS

EQUIPMENT USED

Not all packers used the same equipment. Table 6 presents a detailed summary of the equipment of farm and centralized packers, and the various types used. The figures given are averages for the number of packers reporting that particular item, and not for the total number of packers in each of the two groups.

The major differences in equipment of farm and centralized packers -- aside from the fact that the equipment of centralized packers was more expensive -- was that the centralized packers used more equipment -- sizers, and brushers, plus car heaters in railroad cars to prevent frost damage to potatoes. The investment in grading equipment for centralized associations was about five times as great as that for farm packers. This item represented the major part of the total investment for most packers.

Table 6. - *Value of equipment used by 19 packers, according to type of packer*

Item of equipment	Type of packer			
	Farm		Centralized	
	Number reporting	Average value	Number reporting	Average value
Grader-----	8	\$221		
Sorting table-----	8	113		
Grader, sizer, sorting table			6	\$839
Peck attachment-----	8	56	6	133
Brusher-----	1	200	6	389
Total all grading, sorting, sizing equipment-----	10	445	8	2,255
Scales-----	10	159	8	266
Hand trucks-----	9	34	7	57
Tying machines-----	9	3	8	42
Baskets-----	8	27		
Conveyors and motors-----	7	347	5	585
Car heater-----	2	31	7	325
Miscellaneous equipment-----	10	56	7	457

LABOR

Labor costs as shown in this study are those directly related to the packing process. These operations include: (1) loading potatoes from storage onto grading and packing equipment, (2) grading, (3) bagging and tying, and (4) loading them in a railroad car or truck for shipment.

Two methods were used for loading potatoes into the railroad car or motor truck for shipment. In the first method, the bags were loaded immediately after packing. Here few workers were employed and the rate of loading was slow. In the other method, the bags were stacked after packing, then loaded on the cars or trucks at the completion of all packing. Most or all of the packing crew did the loading, thus increasing the loading rate. Although there was no appreciable difference in the labor costs of loading between the two methods, the first method which eliminated intermediate stacking seems more efficient. But the second method definitely makes better use of transportation facilities, since the waiting time for railroad cars and motor trucks is cut considerably.

The 10 farm packers in this study packed, stacked and then loaded, rather than loading directly after packing. All or a major part of the crew loaded as well as packed.

Except for one packer, all centralized packers, on the other hand, loaded directly to the car or truck without intermediate stacking and

waiting. Five of these nine packers used direct loading exclusively; two, about 90 percent of the time; and one, about half the time.

Since centralized packers for the most part transported their potatoes by rail, railroad cars were on sidings available for loading during the packing operation. In contrast, farm packers usually trucked their potatoes, but could not keep trucks waiting throughout the packing operation.

Farm packers use much unpaid family labor. For the farm packers in the study, slightly over a quarter (27 percent) of all labor was family labor. Larger packers, of course, used a lower percentage than smaller ones. The range for such labor among all farm packers varied from a high of 76 percent to a low of 8 percent. In this study a value was placed on all unpaid labor by the packer and the cost included along with the paid labor, even though the use of this labor does not represent a direct cash outlay for the grower. If only labor representing an actual cash expense were included, farm and centralized packers would compare in total labor costs as follows:

	Size Containers			
	100 lb.	50 lb.	15 lb.	10 lb.
	cents	cents	cents	cents
Farm packers-----	11.9	15.2	15.3	22.8
Centralized packers-----	14.0	13.4	15.5	19.3

In addition to unpaid family labor, some farm packers hired men on a weekly or monthly basis. Since paid labor represents a continuous cost to the farmer, it is possible that their time could be employed more efficiently during the winter months on the potato packing operation than on other farm jobs.

An analysis was made to show the man hours of labor required to pack a hundredweight of the various sizes. These data are presented in table 7. Most labor was devoted to the operations classified under packing, as

Table 7. - *Man hours of labor per hundredweight required for packing white potatoes in various size bags by 19 packers, 1950-51*

Size container	100 lbs.	50 lbs.	15 lbs.	10 lbs.
Number of packers	18	18	19	12
Number of hundredweight	72,793	32,966	81,458	18,533
<u>Hours</u>				
Items of labor:				
Packing-----	.145	.150	.177	.230
Loading-----	.015	.019	.023	.039
Miscellaneous-----	.010	.016	.018	.028
Total-----	.170	.185	.218	.297

was shown in tables 1, 2 and 4. Less labor was required to pack the large sizes. About 75 percent more labor is required for a hundred-weight of 10's and about 28 percent more for 15's than for 100's. During one hour and using an average crew of eight workers, 47 hundred-weight could be graded, packed in hundreds and loaded; 43 hundredweight in 50's; 37 in 15's, and 27 in 10's. The actual number of the smaller containers that could be packed at this average rate would be 86 fifties, 247 fifteens or 270 tens.

Work assignments vary for packing and grading crews according to whether consumer-sized containers or larger containers are being packed. Since more labor is required in filling, weighing and tying the smaller bags, a greater number of workers are needed to pack a given volume in consumer-sized bags than are needed to pack the same volume in larger containers. Therefore, changing from packing one size to another requires shifts in the work assignments of the crew as well as necessary changes in crew numbers. Without these changes, the stage is set for inefficient use of labor.

Packers included in this study generally did not make changes in crew numbers when shifting from packing bags of one size to another size. To some extent, then, the variation in labor requirements given between the bag sizes may be less than would be expected if ideal crews were set up for packing each bag size. What usually happens in practice is that the crew is designed specifically to pack either large bags or consumer-sized bags, but not both. As a result, shifts in packing of one or the other cause inefficiency. For example, if a packer ordinarily packs in consumer-sized bags and changes occasionally to pack his large containers, he keeps the same number of workmen. His men, not needed for packing the larger bags, are shifted to different jobs. They may be shifted to grading, thus increasing the speed at which the potatoes are being run. Or they may be shifted to loading or to some one of the jobs classified as miscellaneous labor in this study. The end effect is that efficient use may or may not be made of this labor.

A worker does a job most efficiently when he has been trained for it and regularly assigned to it. Shifting jobs does not generally lead to efficiency. Therefore, packers who shift frequently between large and consumer-sized bags lower the labor efficiency of their operations. Those who pack nearly all their potatoes in one sized bag should be more efficient packing this bag than packers who pack several sizes. For example, the packer who came nearer to dividing his packaging equally among the four sized bags from day-to-day, also used more labor on each sized container than any of the others.

Packers who pack one particular size for only a short while each day can expect their labor costs on this size to be higher. For example, one packer who packed about 70 percent of his output in 15's also packed nearly all his 50's in intervals of one hour or less. His labor costs for 50's was about three cents higher than for 15's.

Some packers follow a practice of shifting from packing consumer bags to larger containers when a bad lot of potatoes is being run. This

change allows the shifting of a worker from the bagging operation to grading. While this practice may allow greater overall efficiency, it means that the labor costs for the larger containers is higher than if all sizes were packed with potatoes of a constant quantity.

Packers who are near their markets and deliver to their customary retail store outlets, supplying the entire needs of the store, may be at a disadvantage in labor costs. Stores may want both large and small containers in each delivery for bulk displays and packaged displays. The packer cannot then concentrate on a container of a given size under these circumstances, as he might if he were shipping to a wholesale dealer or chain store in a distant city.

OVERWEIGHT

Percentagewise, the quantity of extra potatoes put in the smaller containers to insure that the stated weight is maintained was higher than for larger containers. The actual average weight for each size container was as follows:

	<u>100 lb.</u>	<u>50 lb.</u>	<u>15 lb.</u>	<u>10 lb.</u>
Farm packers:				
Per hundredweight-----	101.5	102.7	103.3	104.0
Per container-----	101.5	51.4	15.5	10.4
Centralized packers:				
Per hundredweight-----	101.0	101.6	102.2	103.2
Per container-----	101.0	50.8	15.3	10.3

The overweight in a hundredweight of fifteens is approximately twice and in tens three times as large as in hundreds.

CONCLUSIONS

This study shows that it costs more to package potatoes in small rather than large containers, and that appreciable cost differences exist within the small sizes. Potato packers -- both farm and centralized -- may therefore benefit by packing potatoes in the least costly popular size. If, however, consumers prefer a size which costs more to package than another, the cost should be reflected in the retail price.

The packers in this study, for example, packaged 15-pound bags of potatoes for less than the 10-pound bags. But if these packers find that consumers demand the 10-pound sizes, despite the added cost of packaging, they would do well to concentrate on packing that size. In the final analysis, then, prepackaging should be geared to the demands of the retail customers.

This study showed some definite cost advantages in consumer-sized packages for centralized packers. They packed 15-pound bags for over 3 cents less per hundredweight than did farm packers. The difference

between the two packer groups for 10-pound bags was even greater, amounting to about 14 cents. Since the consumer-sized packaging will probably become more important in potato marketing, the cost advantage for centralized packers will likely increase.

Growers, however, must also consider other factors in deciding whether to use farm or centralized facilities. If it is necessary for the potatoes to be stored on the farm, rather than at the centralized warehouse, there are some added costs that are not present when centralized storage is used. Bagging on the farm for transportation to the warehouse for later packaging requires labor not needed for farm storage.

Since centralized packers generally have better equipment for packing and more favorable circumstances for grading, they therefore should be able to do a better job. This advantage can be offset, however, by farm packers who have an appreciation of the value of turning out a quality pack. Centralized packers have the disadvantage of one lot of potatoes being quite different in quality from the previous lots. When a change in quality occurs between lots being packed, the graders must adjust to the changes and perhaps the speed at which the potatoes are being run. Good management will be on the lookout for this problem, but if the necessary action is not taken, the result will be that the output of the operation will not be of constant quality. Farm packers do not generally have this problem, since their potatoes should be of a fairly constant quality.

Decision on the use of farm or centralized facilities must depend on local conditions. In Pennsylvania, for example, where nearby markets are the rule and the marketing system ideally suited to production not concentrated in a small area, it appears advantageous for growers to do their own packing. In other areas the reverse is true. In all cases, however, close attention should be paid to grading practices. Strict adherence to grade standards is necessary to build up the reputation for a brand, and to capitalize on the advantage of brand identification to consumers brought about by consumer packaging.

In the period since these costs were collected, the cost picture for potato packers has changed. The prices for paper bags has risen, affecting the costs for 50's, 15's and 10's as presented in this study. Wage rates have risen for most packers, causing increases in the labor costs. The price of potatoes has risen, bringing about increased costs for the overweight put in each container. The effect of these increases has been to increase the differential between the different sized containers. As far as was practicable, actual physical units of the items of cost were presented in this study. Therefore, persons interested in determining the packing cost in the areas studied at any period can do so using the prices and wages that prevail at that particular time.

APPENDIX

PROCEDURE

Selecting Packers to Supply Data

Nineteen farm and centralized packers were selected to provide the data on which this study is based. Of the 19, nine were located in Pennsylvania, seven in Maine and three in Michigan. In each State, packers were chosen in consultation with officials of the major potato cooperative in the State.

Packers were chosen for their willingness, ability and interest in keeping necessary records, plus the fact that they were packing potatoes in both large and small containers. An effort was made to include in each State packers with high volumes and others with low volumes of potatoes.

The States of Maine, Pennsylvania and Michigan were selected because of (1) their heavy potato production, (2) the importance of cooperatives in the marketing of potatoes, (3) their emphasis on consumer packaging of potatoes, and (4) and because potato production in these States best typifies the two packing operations.

Production in the three States is compared with production in other late producing States in Appendix table 1.

Pennsylvania is distinguished for its high percentage of farm packers. It contains an area of scattered production and large nearby markets. The Pennsylvania Cooperative Potato Growers, Inc., Allentown, Pa., which markets a large proportion of the State's potato crop, is set up to bargain for prices, and to accept orders which it relays to individual growers. Thus, decentralized marketing in Pennsylvania with its growers

Appendix Table 1. - *Average yearly production, sales and farm use of white potatoes in selected areas, 1946-49*

Area	Total production	Sales	Farm use
<u>1,000 bushels</u>			
Maine-----	70,136	64,438	5,698
Pennsylvania-----	19,294	15,097	4,197
Michigan-----	17,324	11,853	5,471
Average for all late States-----	12,577	10,473	2,104

Source: Farm Production, Farm Disposition, and Value of Principle Crops, 1946, 1947, 1948 and 1949, Bureau of Agricultural Economics.

performing their own services from grading and packing to delivery has encouraged farm packing. Ten Pennsylvania growers were selected to

provide data on farm packing. Of the 10, one provided insufficient data to be useful.

In many ways potato production in Maine is exactly opposite that in Pennsylvania. Production is centralized, and the markets are distant. Most packing is done off the farm in centralized warehouses. The seven Maine packers in this study were selected after consultation with the Warehouse Department of the Maine Potato Growers, Inc., Presque Isle, Maine. Four of the packers were warehouses of Maine Potato Growers, and three were shippers who operate their warehouses independently but ship through the cooperative.

Michigan potato production shares certain similarities with both Pennsylvania and Maine. Production is less scattered than in Pennsylvania but not as concentrated as in Maine. The markets are somewhat nearer farms than Maine's potato markets. Packing operations are divided between farm and centralized packers, with the latter taking the larger part of the production.

Five packers were selected after consultation with the Michigan Potato Growers Exchange, Inc., Cadillac, Mich., a large regional potato marketing cooperative. Four of these were branches of the Exchange, and the fifth was a farm packer. Two of the Exchange branches were unable to complete the records.

Collecting data. A system of records was designed to gather the necessary data. They were kept by the grower or by the manager of the centralized warehouse after being explained and initiated by a representative of the Farm Credit Administration. Labor records were kept to show the number of workers, hours worked and rate of pay for each day for hired and farm labor. Another form was used to record the hours of labor spent each day on packing various size containers (100, 50, 15, and 10-pounds), and on loading, miscellaneous labor and managerial functions.¹ A third form was used to list the quantity packed each day in the various sizes as well as the quantity of off grade potatoes. A fourth record kept the quantity of each size container loaded for shipment each day.

To determine the quantity of potatoes actually packed in each container, test weights were taken by the packer ten times during the season, if practicable, for each size packed. A form was provided to record these weights. The monthly cost of electricity was kept on another form. All cash expenses throughout the season were recorded on a form provided for this purpose. Another form was used to collect information on the cost of equipment. The enumerator determined the value and the expected remaining life of the equipment during an interview with the packer. The packer thereafter recorded the cost of repairs as they occurred during the season.

Another form was used to collect data on the cost of depreciation on buildings, insurance, taxes and repairs to buildings, the beginning and

¹An alternative method for the collection of data on labor keeps track of each individual worker, recording the rate of pay, hours worked daily, and a detailed breakdown of the total hours. That is, the number of hours spent packing each size, loading each size, or any miscellaneous labor.

closing inventory of supplies and the value of unpaid family labor. This form was filled in by the enumerator in conference with the packer, except for the closing inventory which was taken and recorded by the packer.

Analysis of data. The costs of *materials* were computed using the beginning and ending inventories and the record of cash expenditures. In those cases where buyers furnished bags to the packers, costs were recomputed to make all packers' expenses comparable. Some adjustments were necessary in cases of incomplete or inaccurate data. Costs of packing supplies, other than containers, were allocated to each container size packed on a percentage basis.

Labor costs were computed from the daily records. Packing labor was allocated to each size used according to the reported amount on the daily record. The forms did not provide for tallying labor used in loading each container size. For the days when only one size was loaded, there was no problem. However, for those days on which two or more sizes were loaded a formula for dividing the labor was devised, based on the daily loading rates when only one size was loaded. Miscellaneous labor was allocated to the packing of each container size according to the percentage packed in each size.

The cost of *electricity* was taken from the record provided to keep this cost. The packer furnished estimates of the percentage of the total bill to be charged to the packing operation. Electricity was then allocated according to the percent of the total operating time spent packing each size.

The cost of *repairs* was computed from the cash expenses and the equipment record and allocated on the basis of operating time.

Taxes and insurance paid out were given by the packer and recorded by the enumerator, along with the percentage to be charged to the packing operation. Allocation was on the basis of the percentage of the total volume packed in each size.

In cases where the buildings were owned by the packer, *depreciation* costs were based on the packer's estimated value of buildings and equipment. For rented buildings, the total rent represented the total depreciation charge. The packers and enumerator estimated the percentage of the building used by the packing operations, and the expected life of buildings and equipment. Building depreciation (or rent) was then allocated to each size according to the percent of total volume packed in each size. Equipment depreciation was the same, except for the depreciation cost on equipment used only on 15 and 10-pound containers and was allocated to these two containers on the basis of the percentage packed in each.

The costs for repairs and taxes and insurance shown in this report were negligible for packers who rented buildings since these costs were reflected in the rent paid. This means that the depreciation costs

shown in the tables for renters were higher than the actual depreciation costs because they included the costs for repairs and taxes and insurance. However, since these three costs were added together, along with the cost of electricity, to make up the total "other costs," this total is comparable for all packers, whether they own or rent their building.

The cost of *overweight potatoes* was computed from the records of test weights. These weights were averaged, the container weights deducted, and the average multiplied by the value of the potatoes. The value was computed from the average prices paid growers as reported by the Bureau of Agricultural Economics, U. S. Department of Agriculture.

